

WHAT IS CLAIMED IS:

- 2 1. A method of mixing liquids in microfluidic devices comprising:
- (a) dispensing at least a first liquid and a second liquid into a first chamber to
- 4 form combined liquid;
- (b) discharging said combined liquid of (a) from said first chamber into a
- 6 second chamber via at least one capillary passageway in liquid communication with said
- first chamber, to complete mixing of said combined liquids.
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2. A method of mixing liquids of Claim 1 wherein said combined liquid of
- 10 (a) is discharged into said second chamber through more than one capillary passageway.
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3. A method of mixing liquids of Claim 2 wherein said combined liquid of
- (a) is discharged into said second chamber through at least two capillary passageways.
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4. A method of mixing liquids of Claim 1 wherein said second chamber is in
- 16 liquid communication with at least a third chamber through at least one capillary
- passageway.
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5. A method of Claim 1 wherein said combined liquid of (a) is discharged
- 20 into said second chamber in the form of droplets.
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6. A method of Claim 1 wherein said first chamber has a volume of at least
- about twice that of the combined liquid of (a).
- 24
7. A method of Claim 1 wherein said second chamber has a volume of at
- 26 least about twice that of the combined liquid of (a).

8. A method of Claim 6 wherein said first chamber has a depth of at least
2 about twice that required to hold the combined volume of (a).

4 9. A method of Claim 7 wherein said second chamber has a depth of at least
about twice that required to hold the combined volume of (a).

6 10. A method of Claim 1 wherein a space of at least 100 μm is above the
8 level of liquid in the first chamber.

10 11. A method of Claim 1 wherein a space of at least 100 μm is above the
level of liquid in the second chamber.

12 12. A method of Claim 1 wherein said at least one capillary passageway has a
14 cross-sectional dimension of 1 to 2000 μm .

16 13. A method of Claim 12 wherein said at least one capillary passageway has
a cross-sectional dimension of 200 to 1000 μm .

18 14. A method of Claim 1 wherein said at least one capillary passageway has a
20 length of 0.5 to 100 mm.

22 15. A method of Claim 14 wherein said at least one capillary passageway has
a length of 1 to 50 mm.

24 16. A method of Claim 1 wherein three or more capillary passageways are in
26 liquid communication between said first and second chambers.

17. A method of Claim 1 wherein at least one of said first and second
2 chambers contains steps or ramps to assist mixing of said combined liquids.

4 18. A method of Claim 1 wherein the velocity of said combined liquids of (a)
in said at least one capillary passageway is at least 1 mm/sec.

6 19. A method of Claim 1 wherein said first and second liquids are dispensed
8 from wells into said first chamber through capillary passageways.

10 20. A method of Claim 1 wherein the combined liquids are completely mixed
and thereafter moved to downstream chambers for further processing.

12 21. A microfluidic device comprising:

14 (a) a first chamber for receiving and combining at least a first liquid and a
second liquid;

16 (b) a second chamber for complete mixing of said at least first and second
liquids, said second chamber being in liquid communication with said first chamber via
18 at least one capillary passageway.

20 22. A microfluidic device of Claim 21 wherein said first and second chambers
are in liquid communication through more than one capillary passageway.

22 23. A microfluidic of Claim 22 wherein said first and second chambers are in
24 liquid communication through at least two capillary passageways.

24. A microfluidic device of Claim 21 wherein said second chamber is in
2 liquid communication with at least a third chamber through at least one capillary
passageway.

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25. A microfluidic device of Claim 21 wherein said first chamber has a
6 volume of at least about twice that of the combined volume of said first and second
containers.

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26. A microfluidic device of Claim 21 wherein said second chamber has a
10 volume of at least about twice that of the combined volume of said first and second
containers.

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27. A microfluidic device of Claim 25 wherein said first chamber has a depth
14 of at least about twice the required to hold the combined volume of said first and second
containers.

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28. A microfluidic device of Claim 26 wherein said second chamber has a
18 depth of at least about twice that required to hold the combined volume of said first and
second containers.

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29. A microfluidic device of Claim 21 wherein a space of at least 100 μm is
22 above the level of liquid in the first chamber.

24 30. A microfluidic device of Claim 21 wherein a space of at least 100 μm is
above the level of liquid in the second chamber.

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31. A microfluidic device of Claim 21 wherein said at least one capillary
2 passageway has a cross-sectional dimension of 1 to 2000 μm .

4 32. A microfluidic device of Claim 31 wherein said at least one capillary
passageway has a cross-sectional dimension of 200 to 1000 μm .

6 33. A microfluidic device of Claim 21 wherein said at least one capillary
8 passageway has a length of 0.5 to 100 mm.

10 34. A microfluidic device of Claim 33 wherein said at least one capillary
passageway has a length of 1 to 50 mm.

12 35. A microfluidic device of Claim 21 wherein three or more capillary
14 passageways are in liquid communication between said first and second chambers.

16 36. A microfluidic device of Claim 21 wherein said at least one passageway
is sized to provide a velocity of combined liquids of at least 1 mm/sec.

18 37. A microfluidic device of Claim 21 wherein at least one of said first and
20 second chambers contains steps or ramps to assist mixing or removal of said first and
second liquids.

22 38. A microfluidic device of Claim 21 wherein said first chamber is in liquid
24 communication through capillary passageways with wells containing said at least first
and second liquids.

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39. A microfluidic device of Claim 21 wherein said second chamber contains
- 2 means for preventing premature movement of said liquids before mixing is complete.